SERUM IGE LEVEL IN MICE INFECTED WITH SINGLE DOSES OF ANCYLOSTOMA CANINUM LARVAE

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INTRODUCTION
Gastrointestinal nematode parasites infect a large proportion of the world’s human and domestic/companion animals. The canine hookworm, A. caninum is capable of causing anemia and death in severely infected puppies, and is a useful model for the human hookworm, A. duodenale and Necator americanus. Canine hookworms are of great importance for humans because of their ability to cause zoonosis (Menelaos and Smaragda, 2006). Hookworms suck large amounts of blood from infected hosts leading to fatal anemia (Bowman, 1999). Humans can get hookworm infection through ingestion or direct penetration of hookworm larvae (Little et al., 1983; Prociv and Croese, 1990; Landman and Prociv, 2003). Human enteric infections with infective larvae of A. caninum were reported in Northeastern Australia and Southern USA and infected humans are being suffered due to eosinophilic enteritis (Glickman and Schantz, 1981). Hookworm anemia could be induced from hemolysis or from dysfunction of bone marrow; a decrease in circulating RBC was reported in normal host (mouse) (Vardhani, 1976). Hypercholesterolemia was reported in female Swiss albino mice during A. caninum infection (Vardhani and Krishna Rao, 1995). Hookworm infection retards growth and development in millions of children (Hotez and Pritchard, 1995) and is a major parasitic cause of morbidity in the developing nations of the tropics (Hotez et al., 1999). The school age children in rural areas of the tropics showed highest level of IgE during active infection with A. duodenale (Cooper et al., 2003).

Studies in northeastern Australia reveal that enteric infection with A. caninum is a leading cause of human eosinophilic enteritis; enteric infection of humans with A. caninum secretory and secretory antigens was associated with an increase of IgG and IgE levels (Prociv and Croese, 1996). Sera of humans with Ancylostoma infection showed considerable antibody activity against antigens (Correa-Oliveira et al., 1988; Loukas et al., 2005). Development of antigen specific immunoglobulin E antibody response was found in vaccinated dogs against subcutaneous injection of 500 L3 of canine hookworm, Ancylostoma caninum (Hotez et al., 2003). Viveka Vardhani and Sakunthala (2012) reported no correlation between serum IgG level and worm load in mice during A. caninum infection. The main objective of the study is to determine the level of serum immunoglobulin IgE from male Swiss albino mice infected with various single doses of A. caninum larvae.

MATERIALS AND METHODS
Culture of A. caninum larvae
A pure strain of A. caninum is maintained in an experimentally injected pup, where the infection had been maintained in dogs for several years. Faeces from the infected pup, collected from the floor of the kennel, was cultured in the dark at 26°C for 8 days using the petridish method of Sen et al. (1965).

Acquisition and preparation of experimental animals:
Male Swiss albino mice (6-8 weeks old; 26-28 g. wt.) were purchased from dealers and were divided into 4 groups. Three experimental groups A, B and C with 10 in each were infected with a single dose of 500, 1000 and 2000 larvae of A. caninum respectively. Another group D, with 10 mice, was kept as uninfected control for comparison. Two mice from...
canine hookworm infection results in the decrease of serum IgE levels in mouse host. Comparatively, the level of IgE was greater in mice infected with 500 dose (group A) than in those infected with 1000 (group B) and 2000 (group C) dose on day 1 of infection; this may be because of greater larval retention in group A than in group B and group C. The decreased level of IgE is attributed to the primary immune response mounted by the retained worm load in the host system. These observations confirm that of Bhopale and Johri (1975) who also reported increased level of serum albumin and globulin on day 1 of infection during ancylostomiasis in mice. The peak rise of serum IgE on day 1 in all the 3 infected animals coincides with the maximum immune response of the host – these results confirm those of Vardhani and Johri (1979), Gowri and Vardhani (1992) and Nirmala and Vardhani (2007) who reported significant increase of mast cells, eosinophilia and neutrophilia in the gastrointestinal tract during A. caninum infection in female mice. Increase of both circulating and intestinal eosinophils during the third week of infection and their sustenance up to 30th day was attributed to gut anaphylaxis during ancylostomiasis in mice (Vardhani, 2002 and 2003). The gradual decreased level of serum IgE from day 1 to 30 in all the 3 singly infected groups can be attributed to the poor larval yield as reported by Vardhani and Johri (1981). It is interesting to find that the synthesis of IgE is lowered by the inhibition of essential stimulus, since that agency can thus be excluded from the immune mechanism. The stimulus is a direct action on the synthesis of IgE (reagimic) (allergic) antibody by larval antigens is more probable. The constant association of eosinophil leukocytes with the presence of tissue foreign antigens (during helminthic infection) is well established. There is direct action on the synthesis of IgE (reagimic) (allergic) antibody by larval antigens is more probable. The constant association of eosinophil leukocytes with the presence of tissue foreign antigens (during helminthic infection) is well established. There is a significant difference (in the decreased value of IgE) when the level of serum IgE in experimental (A, B and C) were compared with one another.

DISCUSSION

Table 1: Serum IgE value (g/L) from experimental (group A, B and C) and control (group D, IgE value) mice at different period of infection (values are expressed in mean derived from five observations)

<table>
<thead>
<tr>
<th>Period of infection</th>
<th>Experimental groups</th>
<th>Control group D IgE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IgE</td>
<td>IgE</td>
</tr>
<tr>
<td>1</td>
<td>152.9</td>
<td>142.2</td>
</tr>
<tr>
<td>4</td>
<td>102.9</td>
<td>96.7</td>
</tr>
<tr>
<td>9</td>
<td>78.1</td>
<td>44.8</td>
</tr>
<tr>
<td>16</td>
<td>37.5</td>
<td>47.1</td>
</tr>
<tr>
<td>30</td>
<td>25.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>

Table 2: “T” values obtained for different groups of mice infected with 500, 1000 and 2000 dose of Ancylostoma caninum larvae

<table>
<thead>
<tr>
<th>Groups</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>IgE</td>
<td>Mean</td>
<td>79.28</td>
<td>71.76</td>
<td>75.26</td>
</tr>
<tr>
<td>Tvalue</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>t = 4.62*</td>
<td>t = 3.08*</td>
<td>t = 5.27*</td>
<td>(p &gt; 0.05)</td>
<td>(p &gt; 0.05)</td>
</tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>t = 5.09*</td>
<td>t = 4.93*</td>
<td>t = 3.86*</td>
<td>(p &gt; 0.05)</td>
<td>(p &gt; 0.05)</td>
</tr>
</tbody>
</table>

Note: P value at 5% level of significance is 2.306; *statistically; significant; value.

RESULTS

Infected mice from all the 3 groups survived for 30 days experimental period. The mean values of IgE are shown in Table 1.

The results pertaining to the 3 singly dosed groups (group A, 500 larvae; group B, 1000 larvae; group C, 2000 larvae) showed a marked decrease in the level of IgE when compared with the uninfected controls (group D). Group A showed highest serum IgE level on day 1 (152.9 g/L) (still lower than control) and decreased gradually till day 30 (25.0 g/L). Mice received a single dose of 1000 larvae (group B) showed gradual decline in the level of IgE from day 1 (142.2 g/L) to 30 (28.0 g/L). Mice (group C) infected with a heavy dose (2000 larvae) showed fairly high IgE level on day 1 (111.1 g/L) and decreased gradually by day 30 (28.0 g/L); all the decreased serum IgE levels were not exceeded the IgE level of controls (group D). Statistical analysis of these results indicates that there was a significant decrease in the level of IgE in experimental and compared with controls (Table 2). Also, there was a statistically significant difference (in the decreased value of IgE) when the level of serum IgE in experimental groups were compared with one another.

ACKNOWLEDGEMENTS

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REFERENCES


Vardhani, V. V. 1976. Weight loss, leucocytic counts and immunologically injured peritoneal cell counts in mice infected with Ancylostoma caninum larvae. The Vikram. 20: 41-47.

Vardhani, V. V. 2002. The role of intestinal mast cells and eosinophils in the rejection of the parasite in mice infected with Ancylostoma caninum. The Vikram 21: 1299-1302.


